

Introduction Manual
of
ForceSensorMultiFingerEvaBoardVer1.0 Evaluation Kit

Rev.5

2021.07.21

MITSUMI ELECTRIC CO.,LTD.
Semiconductor Business Div.

■ Evaluation Kit

This Evaluation Kit consists of below:

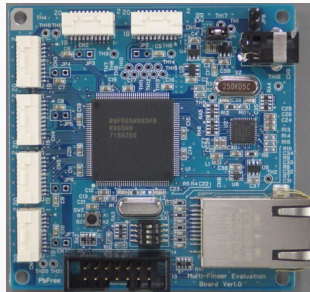
- ✓ Force/Torque Sensor sample



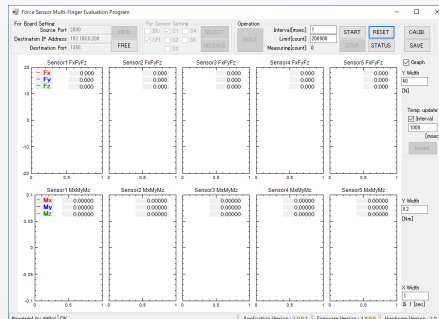
- ✓ Conversion Board
Conv. BD Ver1.0



- ✓ Evaluation Board
ForceSensorMultiFingerEvaBoard Ver.1.0
FW Ver.1.0.0.2



- ✓ Evaluation App. ForceSensor_MultiFingerEvaProgram
App Ver. 1.0.0.2



- ✓ Cable

- Cable for sensor connection



- Ethernet cable
Prepare a 100BASE-TX compliant cabling.

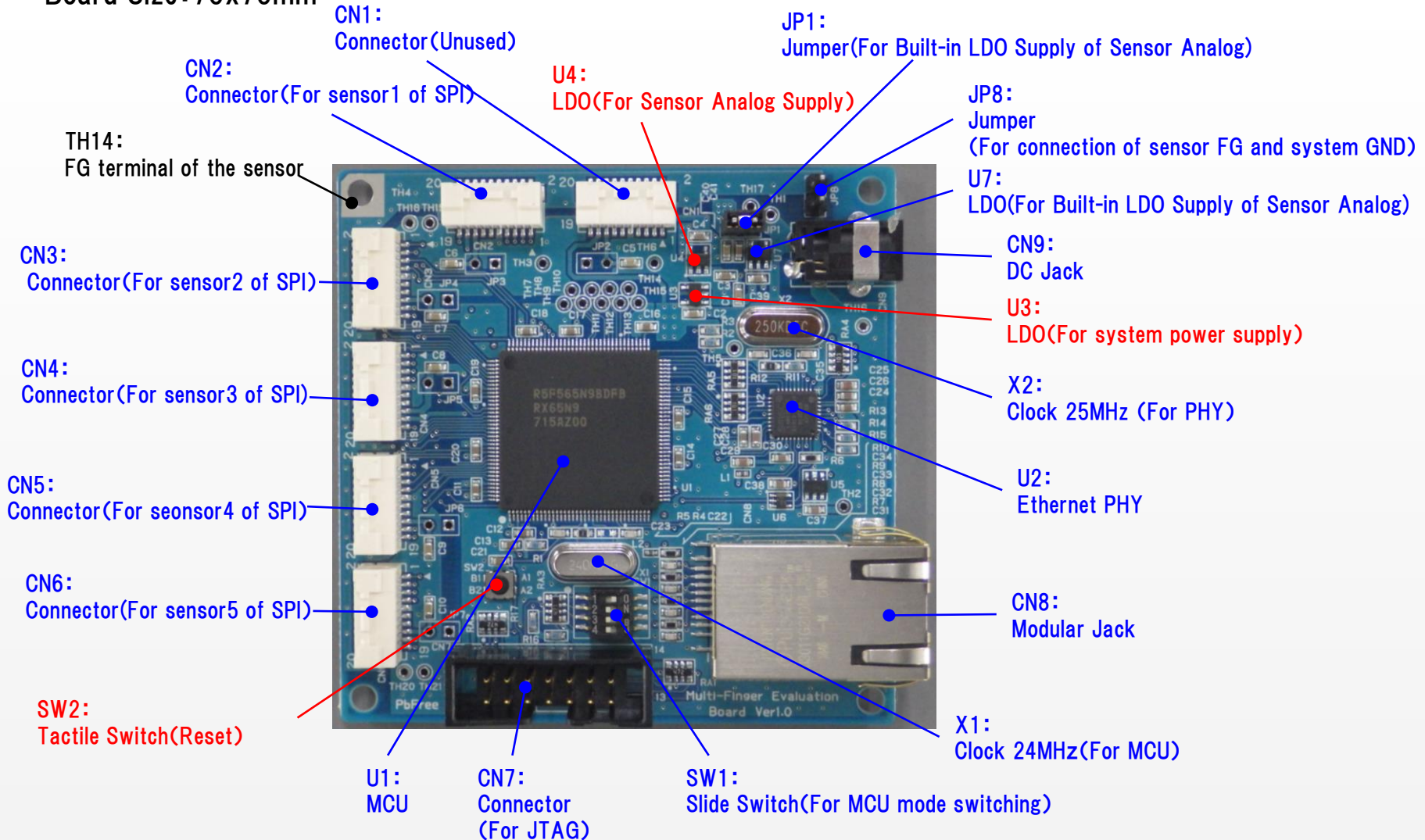
- ✓ AC adaptor



■ Evaluation Board

ForceSensorMultiFingerEvaBoardVer1.0
Board Size: 70x70mm

In Red: Our Products



■ Setting the Evaluation Board

Jumper

●:Factory setting

No	Connection	Setting	Remarks
JP1	Short ●	Power to sensor Enable LDO with built-in sensor	JP1 and JP2-7 are exclusive. Only short-circuit JP1.
	Open	Disable LDO with built-in sensor	
JP2-7	Short	Power to sensor Enable LDO (U4) of the evaluation board	
	Open ●	Disable LDO (U4) of the evaluation board	
JP8	Short	Connection of sensor FG and system GND of the evaluation board	JP8 should be open, and TH14 and chassis GNDs should be connected.
	Open ●		

Connector

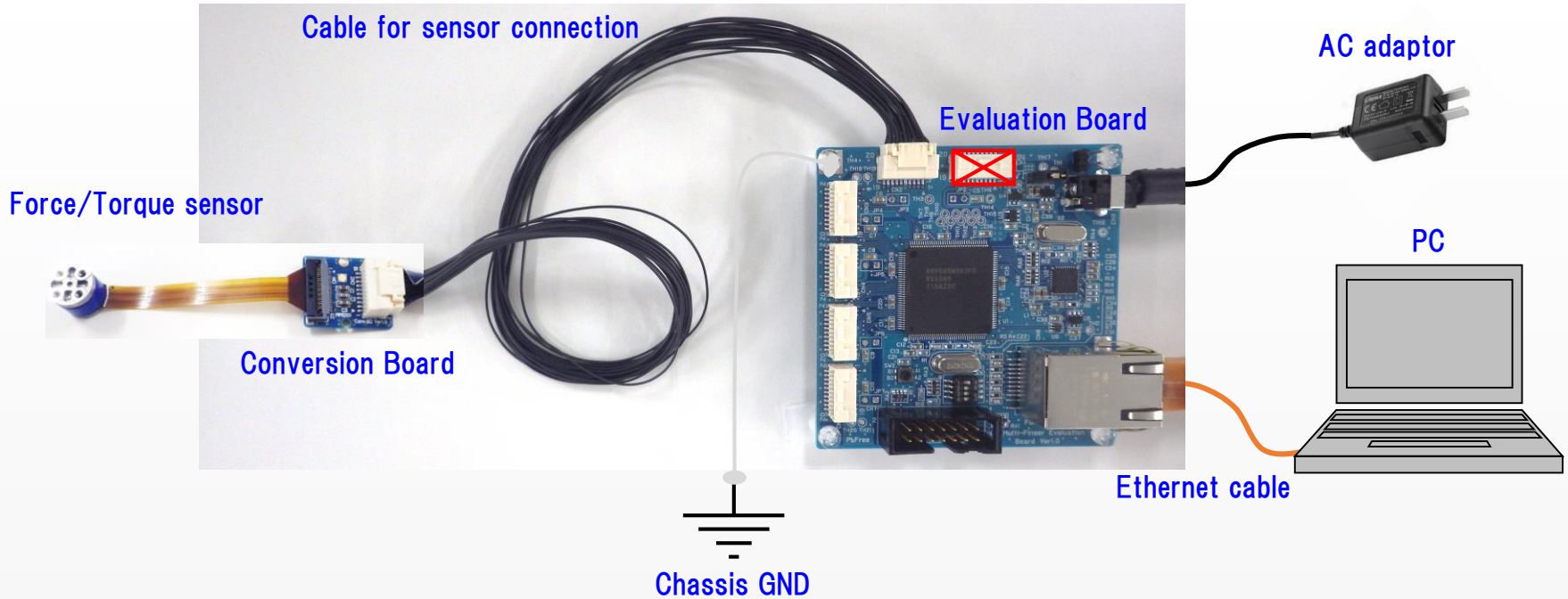
No	Function	Remarks
CN1	-	Unused
CN2-6	For sensor1~5 of SPI connection	

Switch

No	Setting	Function	Remarks
SW1	1 ON	MCU operation mode setting	Do not change for debugging purposes.
	2 OFF		
	3 OFF		
	4 OFF		
SW2		Reset	Reset MCU only.

■ How to connection

Connect the evaluation board as shown below.



■ Communication method

Communication between the host and the evaluation board uses the UDP method for Ethernet communication.

Ethernet communication setting of the evaluation board

	Set value
IP address	192.168.0.200
Sub-net mask	255.255.255.0
Gateway	192.168.0.254
Port No.	1366
MAC address	0x74,0x90,0x50,0x00,0x79,0x03

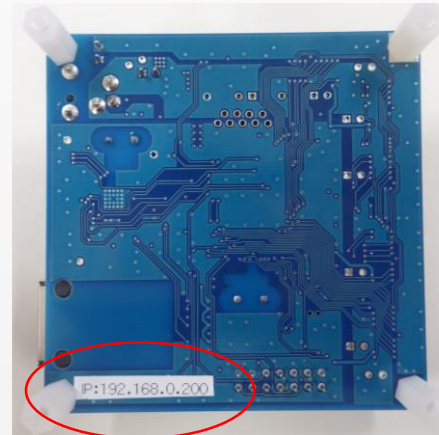
The host-side IP address must match up to the third octet (192.168.0).
 The fourth octet, 200 series, is planned to be used on the evaluation board side.
 Use a number other than 200 series.

■ Setting the evaluation board

The IP address and the MAC address of the evaluation board are managed by the firmware version. The third digit of the firmware version, the fourth digit of the IP address, and the sixth digit of the MAC address are linked.

	Set value		
FW Ver.	1.0. 0 .x	1.0. 1 .x	1.0. 2 .x
IP address	192.168.0. 200	192.168.0. 201	192.168.0. 202
MAC address	0x74,0x90,0x50,0x00,0x79, 0x03	0x74,0x90,0x50,0x00,0x79, 0x04	0x74,0x90,0x50,0x00,0x79, 0x05

The IP address information on the back of the evaluation board



■ Evaluation App

When you unzip the "ForceSensorMultiFingerEvaluationProgram_ver.1.0.0.2" zip file, the file configuration is as follows.

*Do not change the file configuration.

ForceSensorMultiFingerEvaluationProgram_ver.1.0.0.2

- └ ForceSensorMultiFingerEvaluationProgram.exe : App main unit
- └ NPlot.dll : Graph Drawing Library
- └ UserData : Data saving folder

When the connection of the evaluation board is completed, start the app main unit.

*To operate this application, .NET Framework 3.5 must be valid.

The activation procedure is posted on the Microsoft website. If it is not activated, activate it according to the contents of the website.

■ Evaluation App display screen

Ethernet communication setting with the board

- Source Port: PC port number
- Destination IP Address: Board IP address
- Destination Port: Board port number
- ”BIND” button: Communication establishment
- ”FREE” button: Communication release

Communication setting with sensor

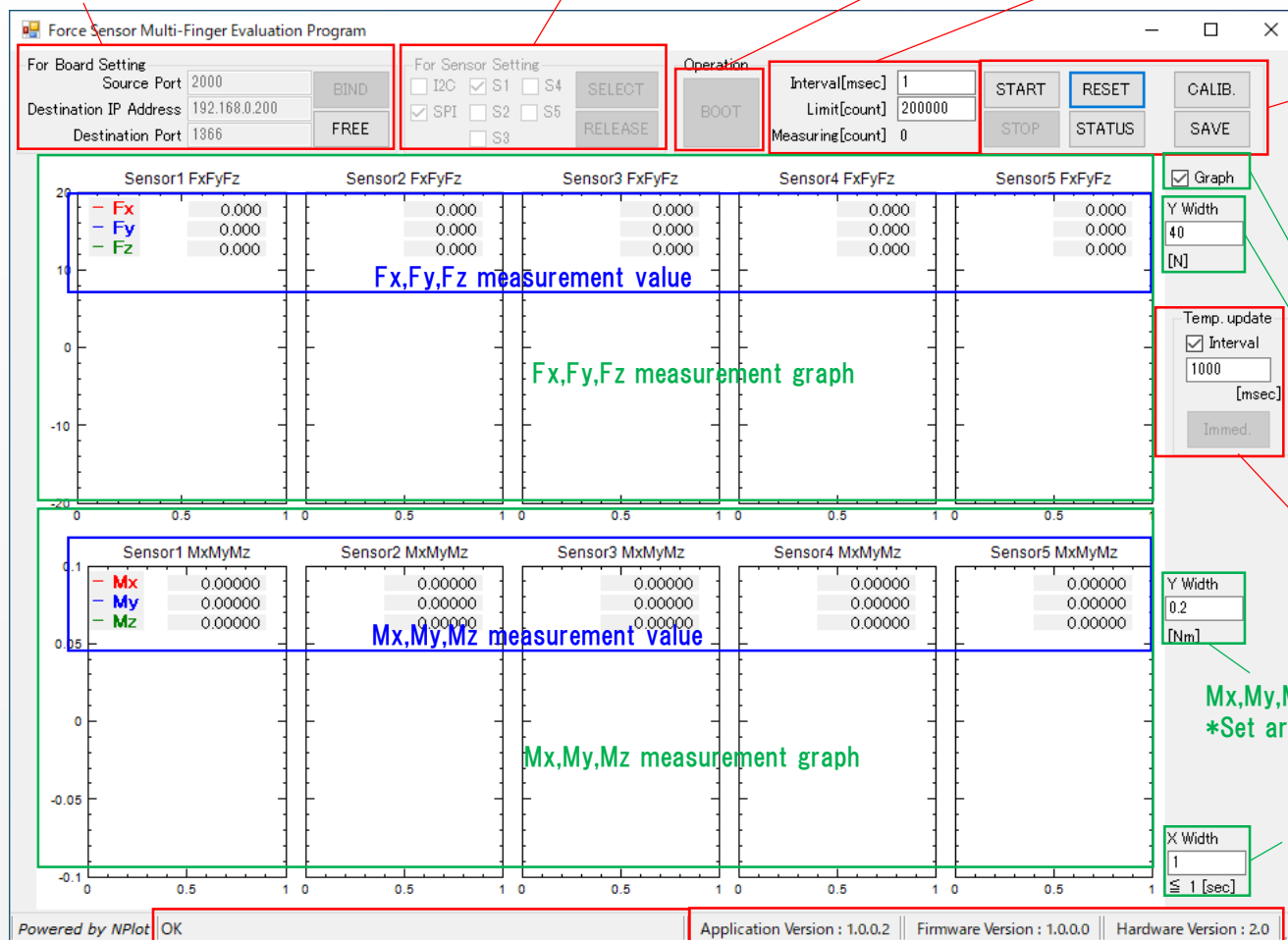
- Select one of I2C or SPI
- F1~F5: Select the sensor to be measured

”BOOT” button:

Read the matrix operation correction coefficients from the sensor

- Interval: Data acquisition interval setting
 - *The setting is 1-1000msec (1msec step)
- Limit: Number of measurements setting
- Measuring: Number of measurements display

- ”START” button: Measurement start button
- ”STOP” button: Measurement stop button
- ”RESET” button: Board initialize button
- ”STATUS” button: Board state check button
- ”CALIB” button: Calibration button
 - *Change to red during calibration
- ”SAVE” button: Data save button
 - *Measurement data is output as a text data.



Graph drawing ON/OFF

Fx,Fy,Fz measurement graph
Y-axis scale setting
*Set around 0 N

- Interval: Temperature update interval setting
 - *1msec step
- ”Immed.” button: Temperature update button
 - *Regardless of Interval setting above, the temperature is updated at the timing of clicking the button.

Mx,My,Mz measurement graph Y-axis scale setting
*Set around 0 Nm

Measurement graph X-axis scale setting
*The maximum value that can be set changes depending value of interval

■ How to use the evaluation application software

1. Communication setting with the board

Set the PC port number, board IP address, and port number, and then click “BIND” button.
 Button “FREE” to cancel.

For Board Setting		
Source Port	2000	BIND
Destination IP Address	192.168.0.200	
Destination Port	1366	FREE

When communication with the board is established, Firmware and Hardware versions of the board are displayed.

Firmware Version : 1.0.0.0		Hardware Version : 1.0
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2. Select the sensor to be measured

Select SPI, use check box of S1 to S5 to select the sensor1 to 5, and then click “SELECT” button.
 Button “RELEASE” to cancel.

For Sensor Setting			
<input type="checkbox"/> I2C	<input checked="" type="checkbox"/> S1	<input checked="" type="checkbox"/> S4	SELECT
<input checked="" type="checkbox"/> SPI	<input checked="" type="checkbox"/> S2	<input checked="" type="checkbox"/> S5	
	<input checked="" type="checkbox"/> S3		RELEASE

3. Click “BOOT” button

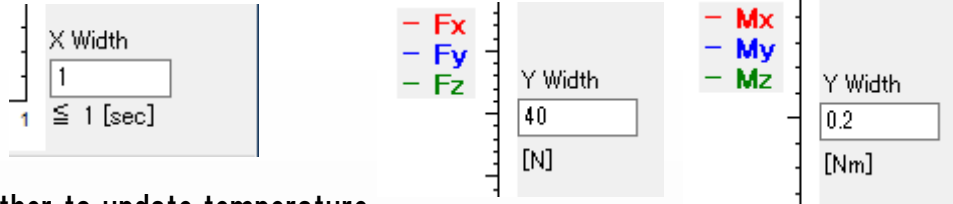
BOOT

4. Enter Interval and Limit

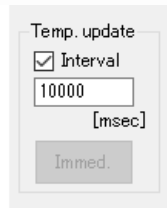
Interval[msec]	1
Limit[count]	200000

■ How to use the evaluation application software

5. Enter X Width and Y Width (Value can be changed even during measurement)



6. Set whether to update temperature



Temperature is updated at set time intervals by checking Interval. (Cannot be changed after START)
“Immed.” button updates the temperature at the timing of clicking the button.

(The key is only enabled after START.)

Temperature updating with the “Immed.” button performs temperature updating regardless of the time interval of Interval.

*Compatible with ver.1.0.0.2

7. Click “START” button to begin measuring

*Data acquisition starts after 10ms. (Points of Note 1 at data acquisition timing chart)

START

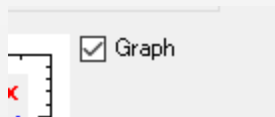
8. Click “STOP” button to stop measuring

When the acquisition of the number of times set in “Limit” is completed, the measurement is automatically stopped.

STOP

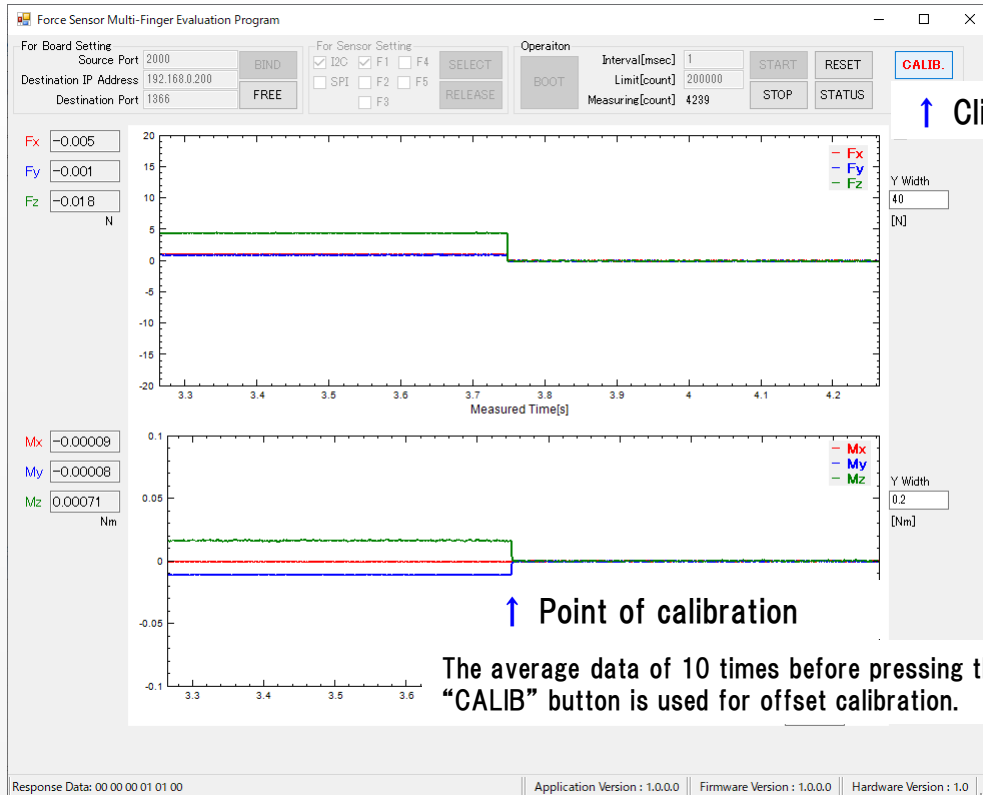
9. Graphing can be disabled by removing “Graph” check box.

Processing capacity is broken in the graph drawing by the specification of the PC, and the data may not be acquired at the cycle set by “Interval”. Graph drawing disabled, data acquisition can be prioritized.



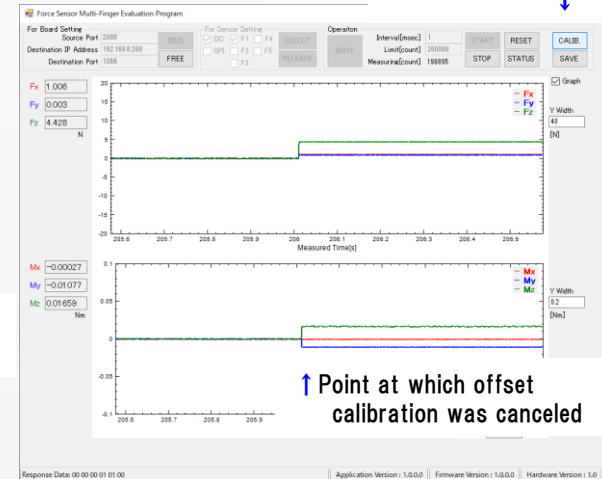
■ Evaluation application software “Function of offset calibration”

The sensor output has an initial offset. Offsets also occur due to mounting and gravity. It is possible to calibrate the offset deviation with the “CALIB.” Button. Press the “CALIB.” Button again to cancel offset calibration.



↑ Clicking “CALIB.” button changes CALIB to red.

Click “CALIB.” button again to return CALIB to black.



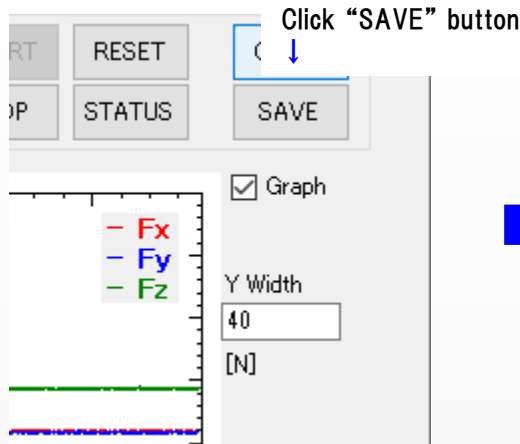
↑ Point at which offset calibration was canceled

↑ Point of calibration
The average data of 10 times before pressing the “CALIB” button is used for offset calibration.

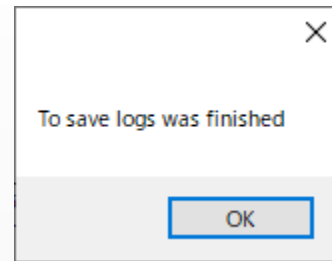
■ Evaluation application software “Data save”

The data acquired by measurement can be saved with the “Save” button.

Data is saved in UserData folders with the file name “Log” + “Date, Time” + “.txt” (LogYYYYMMDDHHSS.txt).



When saving is completed, the following popup is displayed.



The data will be saved in the following format.

The data of the selected sensor is saved.

	count(times)	Measured Time(s)	Interval(usec)	Index	Fx[N]	Fy[N]	Fz[N]	Mx[Nm]	My[Nm]	Mz[Nm]	L	M	N
1	0	0.001	1003	1	0	0	0	0	0	0			
2	1	0.002	1003	1	0	0	0	0	0	0			
3	2	0.003	1005	1	0.014	-0.006	-0.014	0.00014	-9.00E-05	0.0149			
4	3	0.004	1004	1	1.033	0.947	4.439	-0.0002	-0.01091	0.01653			
5	4	0.005	1004	1	1.012	0.945	4.439	-0.00035	-0.01091	0.01642			
6	5	0.009	4090	4	1.029	0.962	4.452	-0.00035	-0.01079	0.01598			
7	6	0.01	1003	1	1.006	0.958	4.459	-0.00055	-0.01085	0.01666			
8	7	0.011	1003	1	1.021	0.946	4.429	-0.00031	-0.01075	0.01643			
9	8	0.012	1082	1	1.018	0.974	4.428	-0.00044	-0.01082	0.01667			
10	9	0.013	1022	1	1.013	0.973	4.431	-0.00041	-0.0108	0.0166			
11	10	0.014	1004	1	1.031	0.951	4.441	-0.00047	-0.01078	0.01684			
12	11	0.015	1010	1	1.012	0.964	4.439	-0.00029	-0.01086	0.01641			
13	12	0.016	1072	1	1.016	0.978	4.43	-0.00045	-0.01084	0.01657			
14	13	0.017	1003	1	1.04	0.964	4.424	-0.00049	-0.01078	0.01619			
15	14	0.018	1003	1	1.002	0.97	4.454	-0.00046	-0.01086	0.01595			
16	15	0.019	1005	1	1.022	0.969	4.439	-0.00054	-0.01077	0.01605			
17	16	0.02	1004	1	1.011	0.946	4.438	-0.00035	-0.01083	0.01608			
18	17	0.021	1005	1	1.01	0.96	4.439	-0.00043	-0.01089	0.01617			